

What is claimed is:

Sub 1

1. An apparatus for forming a ultra-thin film of a semiconductor device comprising:

5 a reactive chamber consisting of an upper container and a lower container junctioned by an O-ring;

a susceptor installed inside the reactive chamber for supporting a target substrate on which a ultra-thin film is to be formed;

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at least two gas supply pipes for respectively supplying at least two material gases into the reactive chamber to form a ultra-thin film on the substrate;

gas supply controllers respectively installed at the gas supply pipes to repeatedly supply the material gases into the chamber;

a gas outlet for discharging the gas from the chamber;

remote plasma generators installed outside the reactive chamber and connected to the gas supply pipes for activating the material gases supplied through the gas supply pipes; and

a temperature controller for controlling the temperature inside the chamber in a heat exchange method, the temperature controller being installed to surround the chamber.

Sub 2

2. The apparatus of claim 1 further comprising:

a grounding unit connected both to the upper container and to the lower container of the reactive chamber to clean inside of the chamber; and

an RF power generator connected to the susceptor to apply an RF power to the susceptor.

3. The apparatus of claim 1, wherein a position controller for moving vertically the susceptor is additionally provided in the susceptor.

5 4. The apparatus of claim 1, wherein a vacuum pump is connected to the gas outlet.

5. A method for forming an ultra-thin film of a semiconductor by adopting the ultra-thin film forming apparatus, comprising the steps of:

10 mounting a substrate on the susceptor;  
introducing different material gases into each of the gas supply pipes;  
selectively operating the remote plasma generators connected to each gas supply pipe and activating the material gas introduced into the gas supply pipes;

15 repeatedly supplying the activated different material gases in each gas supply pipe into the chamber for a predetermined time period in turn,

wherein there is no step for supplying a purging gas between the steps for supplying the activated different material gases.

20 6. The method of claim 5, wherein the step for supplying the activated material gas into the reactive chamber includes a step of supplying a material gas activated in an arbitrary gas supply pipe and vacuum-discharging the gas filled in the reactive chamber through a gas outlet before a different activated material gas is supplied.

7. The method of claim 5, wherein the ultra-thin film is one of  $\text{Al}_2\text{O}_3$ ,  $\text{HfO}_2$ ,  $\text{ZrO}_2$ , BST and PZT.

8. A method for forming a ultra-thin film of a multicomponent system  
5 consisting a first material gas component having a relatively high reactive temperature and adsorption temperature and a second material gas component having a relatively low reactive temperature and adsorption temperature of a semiconductor device by using the thin-film forming apparatus of claim 1, comprising the steps of:

10 mounting the substrate on the susceptor;

introducing the first material gas into one of the gas supply pipes, and selectively operating the remote plasma generators to generate an activated first material gas; and

15 injecting the activated first material gas and the non-activated second material gas through the different gas supply pipes into the reactive chamber for a predetermined time period in turn.

wherein there is no step for supplying a purge gas between the step for supplying the activated first material gas and the step for supplying the second material gas.

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9. The method of claim 8, wherein the temperature inside the reactive chamber is constantly maintained during the step in which the activated first material gas and the nonactivated second material gas are alternately supplied into the reactive chamber.

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10. The method of claim 1, wherein the step of supplying the material gases includes a step of vacuum-discharging the gas filled in the reactive chamber through the gas outlet to empty the chamber between the step of supplying the first material gas and the step for supplying the second material gas.

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11. The method of claim 8, wherein the multicomponent thin film is a BST or a PZT.

11. The method of claim 8, wherein the multicomponent thin film is a BST or a PZT.